Résumé de thèse

The study of fish biodiversity by means of visual census techniques in the Mediterranean Sea, par Pierpaolo CONSOLI.

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The study of biodiversity assumes an important role in the international politics dealing with conservation and management of living resources. The knowledge of biological diversity is basic for its conservation as well as for its protection. Within the actions for the conservation of Mediterranean biodiversity, the study of fish diversity holds a particular importance. From an ecological point of view fish fauna represents an excellent indicator of the environmental variability and an indicator of chemical and physical modifications of this.

The fishery, as collection of samples, offers some important limits due to the impossibility to explore complex environments such as oil rigs or due to its interdiction in several areas as MPA (Marine Protected Areas). In these cases, visual census, appears the best method to study fish diversity. However, since today, visual census techniques have been used to investigate fish fauna within MPA and in a few cases have been used in other areas.

Starting from this realization, it would be interesting to validate and verify the applicability of visual census techniques.

The aims of this PhD research was to investigate fish assemblages associated respectively to an artificial habitat and to a natural rocky habitat by means of visual census techniques.

As artificial substratum three oil platforms located in Ionian Sea have been chosen. Until now, researches on fish biodiversity associated with platforms have been carried out by fishing surveys, hydroacoustic surveys or video recordings from remotely operated vehicles (ROV). On the contrary, in few cases, underwater visual census techniques (UVC) have been employed in off-shore platforms. Actually, these methods can be particularly useful since traditional methods are not able to give information about fish species strictly associated with high complex habitats such as gas platforms.

In conservation field it is often important to protect environments of particular biological relevance, whether for their rarity or for compromise risk. In these environments it is necessary to use not invasive techniques, as visual census, for the evaluation of fish biodiversity. We chose as natural habitat, the promontory of capo Milazzo characterized by the presence of vermetid formations. This area, a large plateaux located in the Northern coast of Sicily (Southern Tyrrhenian Sea), particularly interesting for marine and terrestrial fauna and flora, was proposed as Site of Community Interest. Despite this, the vermetid formations located in the North side of Capo Milazzo’ promontory haven’t ever been studied.

In the first case study, the fish fauna associated with three oil rigs was estimated by means of two visual census methods: strip transects and mobile point counts. The univariate and multivariate statistical analyses conducted, discovered significant differences between the two techniques utilized to assess fish assemblages associated to these artificial habitats.

The transect method was important for the evaluation of species richness and for the complex biodiversity of oil rigs, while the mobile pint count method was used to show the abundance, since the great fish biomass is located around the rigs legs.

From a technical point of view the MPC (Mobile Point Count method) was found more appropriate for the study of fish assemblage living in these particular habitats; in fact, the operations in the water were faster and easier with respect to the other technique. Visual census techniques supplied complementary information, both being adapted to the study of fish assemblages in these habitats, as oil rigs.

The second study provided an accurate description of fish assemblages associated with shallow rocky bottoms along the coast of the promontory.

The survey was conducted at three selected sites (exposed to North, West and East respectively) using a strip transects underwater visual census technique. Given the shallow depth (0-4 m), assessment was carried out by snorkelling evaluating species composition and number of fish along 20 m long and 2 m wide transects (total surface area 40 m2) parallel to the coastline.

The study detected significant difference among the three sites. The results indicate, firstly, that shallow rocky shores around Cape Milazzo were inhabited by 39 fish taxa. The higher values of mean species richness (S), diversity (H’) evenness (J) and density (N) occurred over vermetid reef habitat exposed to North than over the other two sites.

Many environmental factors could explain the observed differences between fish assemblages associated with the three selected sites. For reef-associated fishes, indeed, there is evidence that the structure of the habitat has important effects on spatial distributions of populations.

Moreover, in different fish assemblages, many studies have pointed out that both S and H’ generally increased with habitat complexity, and our results are in accordance.

In fact vermetid reef, in the northern side, provides a more complex three-dimensional biogenic structure. This means greater surface available, thus providing additional resources for adults and juveniles of many species.

Composition and structure of fish assemblages are also influenced by other environmental factor such us depth, bottom type, algal cover, hydrodynamism. Among the physical factor, it has been demonstrated that wave exposure affects shallow water habitats and associated sessile and vagile faunas in the reef habitats. According to Safriel and Ben-Eliahu (1991) a factor affecting the distribution and dimension of the “trottoir à vermets” at small scale, in Mediterranean Sea, is the superficial hydrodynamism: *D. petraeum* is a sedentary, aggregative plankton-feeding snail restricted to sites with the most exstreme wave action. That is why in Sicily, vermetid platforms are found along all North-West coasts. In fact, the vermetid habitat is located exactly in the North-Western side, probably were the hydrodynamism is maximum (in the area of Cape Milazzo 60% of winds blow from West: NW, W and SW winds).

Key words. - Fish biodiversity - MED - Gas platform - Habitat complexity - Visual census - Vermetid reef.

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